

Original Article

Study of serum c-peptide level in newly detected diabetic patients in age group 30-40 years in tertiary care hospital - a cross sectional study

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Abbreviations:

BMI, Body Mass Index

DM, Diabetes Mellitus

FBS, Fasting Blood Sugar

CBC, Complete Blood Count

PPBS, Post-prandial Blood Sugar

ECG, Electrocardiogram

ABSTRACT:

Background: Serum C-peptide is the standard marker of endogenous insulin production and pancreatic β cell function.

The present study was conducted with the aim to study serum C-peptide level in newly detected diabetes of age group 30-40 years in Tertiary care hospital in Tamil Nadu, India.

Materials and Methods: The study was a hospital based, cross sectional study. 100 newly detected diabetes mellitus patients of age group between 30-40 years were screened for fasting serum C-peptide levels and the relation between fasting serum C-peptide levels and age, gender, symptoms, family history of diabetes mellitus, body mass index (BMI), central obesity and total cholesterol. **Results:** The study results showed that, among 61 males, 8 (13%) had serum c-peptide level less than 0.5 and among females, 4(10.3%) had low serum C-peptide. 88 (88%) of the study population had a fasting serum c-peptide value between 0.5-2 mg/dl and 12 (12%) had fasting serum C-peptide value less than 0.5. 68 (68%) of the study populations had cholesterol in range of ≤ 200 and 32 (32%) had cholesterol value from ≥ 200 .**Conclusion:** This study suggests measurement of serum c-peptide levels in newly detected diabetic subjects especially of younger age group is of value. However, there was no significant association between the fasting serum C-peptide level and age, gender, symptoms, family history of diabetes mellitus, BMI, central obesity and total cholesterol.

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1. INTRODUCTION

During the last twenty years the prevalence of diabetes has increased dramatically in many parts of the world and the disease is now a worldwide public health problem. Diabetes mellitus, a chronic metabolic disorder, is a major cause of mortality and morbidity worldwide [1]. India is now ranked as a country with the greatest number of diabetics. This is being extrapolated to under 8 crore diabetics by the year 2030 [2]. Diabetes is one among the most financially draining chronic noncommunicable disease. The costs for treatment rising and the burden it bears on family/individual finances and society makes it essential to approach this disease in a more collective entirety [3].

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. Depending on the etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production. The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system [1].

The prevalence of diabetes for all age groups worldwide was estimated to be 2.8% in 2000 and about 4.4% in 2030 [1]. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030 [4]. The prevalence of diabetes is higher in men than women, but there are more women with diabetes than men. The urban population in developing countries is projected to

double between 2000 and 2030. South Asians have a one in three lifetime risk for the development of diabetes, developing the condition ten years earlier than Europeans. The greatest relative increase will occur in the Middle Eastern Crescent, Sub-Saharan Africa and India. The greatest absolute increase in the number of people with diabetes will be in India from 31.7 million in 2000 to 79.4 million in 2030. (4) India has the highest number of patients with known diabetes worldwide, with a prevalence of 11.6% in urban areas. India is thus designated to become the diabetes capital of the world [5]. The magnitude of the problem is compounded by the various complications targeting vital organs [6].

To effectively manage DM, it is imperative to understand it. Several distinct types of DM exist and are caused by a complex interaction of genetics and environmental factors and can also be characterized by an absolute or relative lack of insulin. Classified as Type I and Type II, respectively. Type IA diabetes (effects 18 years and younger) is a lack of insulin resulting from near total autoimmune destruction of the pancreatic β -cells and another subdivision Type IB also due to β -cells destruction. Its etiology is not ascertained yet. Type II DM is a heterogeneous group of disorders characterized by variable degrees of insulin resistance, impaired insulin secretion, and increased glucose production. Distinct genetic and metabolic defects in insulin action and or secretion give rise to the common phenotype of hyperglycemia in Type II DM and have important potential therapeutic implications with newer pharmacologic agents that target specific metabolic derangements [7].

Type 2 Diabetes mellitus is the most common type of diabetes in the world constituting 90-95% of the diabetic population. [8]. The global prevalence of Type 2 Diabetes mellitus is estimated to increase from 4% in 1995 to 5.4% by the year 2025 [9, 10]. Type 1 Diabetes mellitus accounts for only 5-10% of the diabetic population [8]. The prevalence of Type 2 Diabetes mellitus is 2.4% in rural population and 11.6% in the urban population of India.

Significant relevance has been placed on the etiology by the World Health Organization as does the American Diabetic Association (ADA) [11] emphasis is being laid to preempt and to manage diabetes through a combination of pharmacology, lifestyle diet, and exercise. For patients newly diagnosed with type II DM, early and aggressive intervention strategies that combine maximal glucose lowering efficacy alongside potential cell preserving properties may provide an opportunity to delay or prevent progression of the disease [12].

C-peptide levels in diabetic patients play an essential role in the classification of diabetes. Lack or diminished levels of C-peptide is associated with diagnosis of type 1 diabetes and insulin dependence [13]. C-peptide can also be used for diagnosing the cause of hypoglycemia. It can differentiate between hypoglycemia due to insulinoma or due to sulphonylureas. In case of insulinomas the patient will have high levels of C-peptide and normal insulin levels [14]. The great interest in C-peptide is due to the limitations of the use of serum insulin as a measure of insulin secretion. After its secretion in to the portal vein, insulin passes through the liver where

approximately 50% of the insulin delivered is extracted [15]. Peripheral insulin concentrations therefore reflect post hepatic insulin delivery rather than the actual secretory rates of insulin.

Patients having a low C-peptide level benefit by initiating early insulin therapy. This helps in preserving the β -cell function by decreasing the immune process of islet cell destruction. Insulin therapy may be discontinued confidently in patients having an adequate post mean C-peptide response. Until the development of C-peptide assays, evaluation of cell function in insulin treated patients was impossible as the insulin assay is unable to discriminate between secreted and injected insulin. With the advent of newer drugs to overcome insulin resistance it has become all the more important to know about the pathophysiology of diabetes, whether endogenous insulin secretion is normal and to know about insulin resistance [15].

Measurement of C-peptide, which is co-secreted with insulin from beta cells of pancreas (proinsulin, insulin C-peptide) provides an index of endogenous insulin production and pancreatic beta cell function. Once diabetes is diagnosed, assay for C-peptide can be used to differentiate type 1 and type 2 behaviour and to distinguish those who require insulin treatment from others who can be managed by diet, exercise and oral antidiabetic drugs. The incidence of Type 1 behaviour among adults initially classified as Type 2 was found to be around 10% [16]. The world statistics show that common age of detecting Type 2 Diabetes is 40-45 years. The Asian (Indian) Statistics show that it is 5-10 years earlier than that of world statistics. So, my study focuses on

individuals between 30-40 years. This study is to demonstrate or test the ability of serum C-peptide levels as a marker in initiating appropriate drug therapy and classifying newly detected diabetes in subjects between 30 -40 years of age. To further understand the role of C-peptide in diabetes treatment and fill the knowledge gap, this study is aimed to demonstrate the ability of serum C-peptide levels as a marker in initiating appropriate drug therapy and classifying newly detected diabetes in subjects between 30 - 40 years of age. Our main objective of this study is to study serum C-peptide level in newly detected diabetes of age group 30-40 years.

2. MATERIALS AND METHODS

This is a hospital based cross-sectional study involving 100 subjects newly diagnosed diabetes mellitus attending Coimbatore medical college Hospital, Coimbatore were studied. Subjects in the age group of 30-40 years, who were newly diagnosed of diabetes mellitus according to WHO/ADA 2015 guidelines were included. The exclusion criteria were (1) Patients who were on treatment for type 2 diabetes mellitus, (2) Patient with renal failure, (3) Diabetic subjects less than 30 years age group and more than 40 years age group, (4) Patients who presented with serious infections, malignancy, DKA, etc. at the time of diagnosis. Data collection was done by clinical history, examination and investigations. The data collected was subjected to statistical analysis for determining the significance of the results. The following data were collected. Clinical history: age and gender, symptomatic/asymptomatic on diagnosis, any past

history of hypertension, other endocrinological illness, drug intake, any family history of diabetes, hypertension, cardiac disease and renal failure, history of alcohol consumption, history of smoking. Clinical Examination: anthropometric measurement including height, weight, body mass index, waist circumference, hip circumference, waist to hip ratio. The waist circumference was measured at the midpoint between the lower border of the rib cage and the iliac crest, whereas the hip circumference was obtained at the widest point between the hip and buttock. Complete clinical examination including pulse, blood pressure measurements in supine and standing position, respiratory, cardio vascular and abdomen examination. Investigations: Fasting Blood Sugar (FBS), Postprandial Blood Sugar (PPBS), Fasting C-Peptide, Complete Blood Count (CBC), Blood Urea, Serum Creatinine, Serum electrolytes, Total Cholesterol, ECG. Statistical analyses were performed using SPSS software. Pearson's Chi-square test was used as a statistical test of significance and p value less than 0.05 was considered as statistically significant.

3. RESULT

The mean age of the study participants was 34.450 ± 2.789 years with majority (68%) of them were in the age group of 30-35 years as shown in table 1. Among the 100, study participants 61% were males and 39% were females. Among males 60.7% were in the age group of 30-35 years and 79.5% of females were in the age group of 30-35 years. Majority 33 % of the study participants had family history of diabetes mellitus. Alcohol and tobacco use

were found among 30% and 28% of the study participants respectively. 10% of the study participants were found to be Obese and 37% were overweight. Majority of the study participants 53% had normal BMI. More females were found to be overweight/obese than males as shown in Table 1. Obesity was more common in 36-40 years of age. Majority 35% of them in 30-35 years of age had normal BMI as shown in table 2. With respect to central obesity, among males 45.9 % had waist circumference above 90 cm and 36% had waist hip Ratio more than 1. 61.5% of females had waist circumference above 80 cm and 56.4% had waist hip Ratio above normal of >0.85 as shown in table 3. The mean height of the study participants was 161.390 ± 5.096 and mean weight was 60.710 ± 7.068 . The mean BMI of the study participants was 23.333 ± 2.791 . The mean height, weight and BMI were similar between males and females. There is no significant difference. The mean waist circumference was found to be 87.720 ± 7.997 cm and mean WHR was 0.892 ± 0.064 as shown in table 4. The Mean arterial fasting blood sugar was 174.01 ± 24.800 . The mean fasting blood sugar among males and females were statistically similar with 175.131 ± 26.065 in males and 172.256 ± 22.901 in females ($p>0.05$) as shown in table 5. Mean postprandial blood sugar was 257.29 ± 33.88 . The mean postprandial blood sugar level among males was 256.410 ± 32.521 and among females was 258.667 ± 36.313 as shown in table 6. The Mean total cholesterol was 193.840 ± 42.155 . The mean cholesterol level among males were 185.607 ± 37.387 and among females were 206.718 ± 46.299 as

shown in table 7. Among the study participants 12% had low serum fasting C peptide level of less than 0.5. Among 61 males, 8 (13.1%) had serum C peptide level less than 0.5 and among 39 females, 10.3% had low serum C peptide (<0.5). However, this difference is not statistically significant ($p>0.05$) as shown in table 8. The Fasting Serum C Peptide level among both the age category was similar. There is no significant difference between the groups ($p>0.05$) as shown in table 9. Among those who had symptoms, 5% had low serum C peptide level and among those without any symptoms, 13.8% had low serum C peptide. However, this difference is not statistically significant as shown in table 10. 13.4 % of those without any family history had low fasting serum C peptide compared to 9.1% among those with family history. This difference is not statistically significant as shown in table 11. 8 Out of 12 participants, who had Low serum C peptide level had Normal BMI level and remaining 4 were overweight. However, this difference is not statistically significant as shown in table 12. There is no significant difference in low serum C Peptide level and Central obesity. Among those with Central obesity 9.5% had low fasting serum C peptide level and among those without central obesity 12.7% had fasting serum C peptide level <0.5 (Fischer Exact test) as shown in table 13. Distribution of Fasting serum C peptide is similar in both the cholesterol groups. 11.8% with low fasting serum C peptide level had total cholesterol value less than 200 compared 12.5% in those with total cholesterol above 200 as shown in table 14.

3.1 DISCUSSION

The world statistics show that the common age of detecting Type 2 diabetes is 40- 45 years. The Indian

statistics show that it is 5-10 years earlier than that of world statistics. So, our study focused on newly detected diabetic subjects of age group 30-40 years. In our study, we took newly diagnosed subjects by estimating fasting serum c- peptide levels. Serum c- peptide is the standard marker of endogenous insulin production and pancreatic β cell function. 100 study populations of newly detected diabetes mellitus patients of age group between 30-40 years were screened for fasting serum c-peptide levels and the relation between fasting serum c-peptide levels and age, gender, symptoms, family history of diabetes

mellitus, body mass index (BMI), central obesity and total cholesterol.

Highest percentage 68(68%) of study participants were in the age group of 30-35 years and 32(32%) of them were in the age group of 36-40 years. The study findings are consistent with the study conducted by Gupta S K et al a study to estimate the usefulness of the Indian diabetes risk score for detecting undiagnosed diabetes in the rural area of Tamil Nadu [17]. Results showed that a large number of the subjects 948 (50%) were below 35 years of age. Out of 100 study populations, 61 (61%) of them were male and 39 (39%) of them were

Age	Male (%)	Female (%)	Total
30-35 years	37(60.7)	31(79.5)	68
36-40 years	24(39.3)	8(20.5)	32
Total	61	39	100
Mean $\pm$ SD	34.984 $\pm$ 2.878 years	33.615 $\pm$ 2.445 years	34.450 $\pm$ 2.789 years
BMI	Male (%)	Female (%)	Total
18.5-22.9	35(57.4)	18(46.2)	53
23-27.5	20(32.8)	17(43.5)	37
>27.5	6(9.8)	4(10.3)	10
Total	61	39	100

Table 1. Age and BMI wise distribution of the study participants

Age	BMI			Total
	Normal	Pre-Obese	Obese	
30-35 years	35	31	2	68
36-40 years	18	6	8	32
Total	53	37	10	100

Table 2. Distribution of BMI of study participants based on age category

Gender	Waist circumference		Waist hip ratio		Total
	>90cm	<90 cm	>1.0	<1.0	
Males (N=61)	28	33	22	39	61
Females (N= 39)	>80 cm	<80 cm	>0.85	<0.85	39
	24	15	22	17	

Table 3 Distribution of study participants based on waist circumference and waist hip ratio

MEAN $\pm$ SD	Male	Female	Total
Height (cm)	163.180 $\pm$ 4.995	158.590 $\pm$ 3.884	161.390 $\pm$ 5.096
Weight (Kg)	61.377 $\pm$ 7.062	59.667 $\pm$ 7.042	60.710 $\pm$ 7.068
BMI	23.072 $\pm$ 2.736	23.740 $\pm$ 2.862	23.333 $\pm$ 2.791
WC (cm)	88.246 $\pm$ 9.001	86.897 $\pm$ 6.129	87.720 $\pm$ 7.997
WHR	0.915 $\pm$ 0.066	0.856 $\pm$ 0.040	0.892 $\pm$ 0.064

Table 4. Anthropometric measurements of the study participants

FBS (mg/dl)	Male	Female	Total	p value
126-180	43 (70.5%)	26 (66.7%)	69	0.574
181-250	18 (29.5%)	13 (33.3%)	31	
Total	61	39	100	
Mean $\pm$ SD	175.131 $\pm$ 26.065	172.256 $\pm$ 22.901	174.01 $\pm$ 24.800	

Table 5. Fasting blood sugar (FBS) levels of the study

PPBS	Male	Female	Total	p value
201-300	52 (85.2%)	35 (89.7%)	87	0.747
301-400	9 (14.8%)	4 (10.3%)	13	
TOTAL	61	39	100	
Mean $\pm$ SD	256.410 $\pm$ 32.521	258.667 $\pm$ 36.313	257.29 $\pm$ 33.88	

Table 6. Distribution of the study participants based on postprandial blood sugar levels (PPBS)

Total Cholesterol	Male	Female	Total
≤ 200	46 (75.4%)	22 (56.4%)	68
> 200	15 (24.6%)	17 (43.6%)	32
TOTAL	61	39	100
Mean $\pm$ SD	185.607 $\pm$ 37.387	206.718 $\pm$ 46.299	193.840 $\pm$ 42.155

Table 7. Total cholesterol level among the study participants

Fasting C peptide	Male	Female	Total	p value
0.1-0.4	8 (13.1%)	4 (10.3%)	12	0.761
0.5-2	53 (86.9%)	35 (89.7%)	88	
Total	61	39	100	

Table 8. Association between fasting serum c peptide level and gender

Age	Fasting C peptide		Total	p value
	0.1-0.4	0.5-2.0		
30-35 years	8 (11.8%)	60 (88.2%)	68	0.916
36-40 years	4 (12.5%)	28 (87.5%)	32	
Total	12	39	100	

Table 9. Association between fasting serum C peptide and age category

Symptoms	Fasting C peptide		Total	p value
	0.1-0.4	0.5-2.0		
No	11 (13.8%)	69 (86.3%)	80	0.451
Yes	1 (5%)	19 (95%)	20	
Total	12	88	100	

Table 10. Association between fasting serum c peptide and symptoms

Family history	Fasting C peptide		Total	p value
	0.1-0.4	0.5-2.0		
No	9 (13.4%)	58 (86.6%)	67	0.746
Yes	3 (9.1%)	30 (90.9%)	33	
Total	12	88	100	

Table 11. Association between fasting serum c peptide and family history of diabetes mellitus

BMI	Fasting C peptide		Total	p value
	0.1-0.4	0.5-2.0		
18.5-23	8 (15.1%)	45 (84.9%)	53	0.388
23-27.5	4 (10.8%)	33 (89.2%)	37	
>27.5	0	10 (100%)	10	
Total	12	88	100	

Table 12. Association between fasting serum C peptide level and BMI

Central obesity	Fasting C peptide		Total	p value
	0.1-0.4	0.5-2.0		
No	10 (12.7%)	69 (87.3%)	79	0.451
Yes	2 (9.5%)	19 (90.5%)	21	
Total	12	88	100	

Table 13. Association between fasting serum C peptide level and central obesity

Total Cholesterol	Fasting C Peptide		Total	p value
	0.1-0.4	0.5-2.0		
≤200	8 (11.8%)	60 (88.2%)	68	0.747
>200	4 (12.5%)	28 (87.5%)	32	
Total	12	88	100	

Table 14. Distribution of study participants based on fasting serum C peptide level and total cholesterol

females. The study findings are consistent with the study conducted by Prerna, Jadeja J.M and Naik Shobha S with 300 people aged ≥ 30 years to assess the prevalence of type 2 Diabetes Mellitus in the general population of Ahmedabad City [18]. Results

showed that prevalence increases with increasing age. The prevalence of diabetes is significantly more among males (29.5%) than females (14.6%). Majority 67 (67%) of the study participants had no family history of diabetes mellitus and 33 (33%) of

them had family history of diabetes mellitus. The study findings are consistent with the study conducted by Gupta S K et al a study to estimate the usefulness of the Indian diabetes risk score for detecting undiagnosed diabetes in the rural area of Tamil Nadu [17]. Results showed that, 1715 (87.91%) had no family history of diabetes mellitus. Most 70 (70%) and 72 (72%) of them had no history of alcohol and tobacco use and 30 (30%) and 28 (28%) had history of alcohol and tobacco use respectively. In this study, 10 (10%) of the study populations were found to be obese, 37 (37%) of them were overweight and 53 (53%) of them had normal BMI. More females were found to be overweight/obese than males. Regarding distribution of BMI, based on age category, obesity was found more common in 36-40 years of age. Majority 35 (35%) of them in 30-35 years of age had normal BMI. With respect to central obesity, among males 45.9% had waist circumference above 90 cm and 36% had waist hip ratio more than 1. 61.5% of females had waist circumference above 80 cm and 56.4% had waist hip ratio above normal of >0.85 . Regarding anthropometric measurements of the study population, the mean height was 161.390 ± 5.096 , mean weight was 60.710 ± 7.068 and mean BMI was 23.333 ± 2.791 . The mean height, weight and BMI were similar between male and female. There was no significant difference. The mean waist circumference was found to be 87.720 ± 7.997 cm and mean WHR was 0.892 ± 0.064 . With respect to fasting blood sugar, the mean arterial fasting blood sugar was 174.01 ± 24.800 . The mean fasting blood sugar among males and females were statistically

similar with 175.131 ± 26.065 in males and 172.256 ± 22.901 in females at $p>0.05$ level. Regarding postprandial blood sugar level, mean postprandial blood sugar level was 257.29 ± 33.88 . The mean postprandial blood sugar level among males was 256.410 ± 32.521 and among females was 258.667 ± 36.313 . The mean total cholesterol was 193.840 ± 42.155 . The mean cholesterol level among males was 185.607 ± 37.387 and among females was 206.718 ± 46.299 .

In our study, among those who had symptoms, 5 (5%) had low serum c-peptide level. The study results showed that, among 61 males, 8 (13%) had serum c-peptide level less than 0.5 and among females, 4(10.3%) had low serum c-peptide. In our study, 9 (13.4%) of those without any family history had low fasting serum c-peptide level. This observation supports the guidelines of ADA, which suggests early screening of subjects with first degree relatives having diabetes [19]. In our study, 8 (15.1%) out of 12 study participants, who had low serum c-peptide level had normal BMI level. In our study, among those with central obesity, 2 (9.5%) had low fasting serum c- peptide level and those without central obesity 10 (12.7%) had fasting serum c- peptide level. In our study 8 (11.8%) with low fasting serum c-peptide level had total cholesterol values less than 200 compared 4 (12.5%) in those with total cholesterol above 200. There was no significant association between the fasting serum c-peptide level and age, gender, symptoms, family history of diabetes mellitus, BMI, central obesity and total cholesterol. These study findings are consistent with the study conducted by Goutham V V N,

Chaitanya M V K and Dasu K [20] conducted a study to assess the serum C- Peptide levels in newly detected diabetes subjects of age group 30-40 years in Narayana Medical College, Nellore. Results showed that, of 26 subjects with BMI less than 23 kg/m², 14 subjects (28%) had normal or high serum C-peptide values. Asian Indians have an unexpectedly high percentage of body fat relative to BMI and muscle mass; this is associated with a proportionate increase in visceral fat. They are markedly insulin resistant and hyperinsulinemic, 23 (46%) subjects who were either overweight or obese, had normal or high serum C-peptide values. This strengthens the view, that overweight or obesity associated with type 2 diabetes mellitus may be due to insulin resistance, of the 12 subjects with BMI >27.5 kg/m², 7 subjects (58.3%) had dyslipidemia according to NCEP ATP III guidelines, there was a positive family history in 30 subjects (60%). Twenty-two out of 30 (73.3%) subjects with positive family history had normal or high serum C- peptide values and out of 13 subjects who had low serum C-peptide values, 8 subjects (61.5%) had personal history of consumption of alcohol and 5 subjects (38.4%) had history of smoking.

In summary, the present study was conducted with the aim to study serum c-peptide level in newly detected diabetes of age group 30-40 years in Coimbatore Medical College Hospital Coimbatore. It was a hospital based, cross sectional study. Ethical clearance was obtained from the Institutional Ethical Committee. 100 study populations of newly diagnosed diabetes mellitus were recruited based on the inclusion criteria. After selection, oral informed

consent was obtained in order to ensure the willingness to participate in this study. Data collection was done using clinical history, examination (anthropometric measurements such as height, weight, BMI, Waist circumference, Hip circumference and Waist hip ratio as well as clinical examination such as pulse, blood pressure measurements in supine and standing position, respiratory, cardio vascular and abdomen examination) and investigations (Fasting blood sugar (FBS), Postprandial blood sugar (PPBS), fasting C- Peptide, complete blood count (CBC), Blood urea, Serum creatinine, Serum electrolytes, Total Cholesterol, ECG (12 lead). The data were collected for the period of 1 year. The data analysis was done using SPSS software. The collected data were analyzed using descriptive and inferential statistics. Results showed that, (i) Majority 68 (68%) of the study populations were in the age group of 30-35 years, (ii) Among 100 study populations, 61 (61%) were males, (iii) Most of them 67 (67%) didn't have family history of diabetes mellitus, (iv) Most 70 (70%) and 72 (72%) of them had no history of alcohol and tobacco use and 30 (30%) and 28 (28%) had history of alcohol and tobacco use respectively, (v) Majority of the males 45.9% had waist circumference above 90 cm and 36% had waist hip ratio more than 1. 61.5% of females had waist circumference above 80 cm and 56.4% had waist hip ratio above normal of >0.85, (vi) Most 53 (53%) of the study populations had normal BMI. More females were found to be Overweight/Obese than males, (vii) Majority 35 (35%) of the study populations in 30-35 years had normal BMI, (viii)

Majority 69 (69%) of the study populations had fasting blood sugar values in range of 126-180 mg/dl and 31 (31%) had fasting blood sugar value from 181-250 mg/dl, (ix) Majority 87 (87%) had postprandial blood sugar values in range of 201-300mg/dl and 13 (13%) had postprandial blood sugar from 301- 400mg/dl, (x) Most 68 (68%) of the study populations had cholesterol in range of ≤ 200 and 32 (32%) had cholesterol value from ≥ 200 , (xi) 88 (88%) of the study population had a fasting serum c-peptide value between 0.5-2 mg/dl and 12 (12%) had fasting serum c-peptide value less than 0.5, (xii) There was no significant association between the fasting serum c- peptide level and age, gender, symptoms, family history of diabetes mellitus, BMI, central obesity and total cholesterol.

3.2. CONCLUSIONS

In conclusion, measurement of fasting serum c-peptide levels (an index of endogenous insulin secretory capacity of β cells) in a newly detected diabetic adult helps to distinguish between type-1 and type-2 behavior and in initiation of treatment. 12% of the study population had low serum c-peptide, for them early initiation of insulin therapy will decrease long term complications of diabetes mellitus. The patients with low serum c peptide level need lifelong insulin therapy. Remaining 88% had normal serum c-peptide level in where, life style modification with oral hypoglycemic drug is needed for better glycaemic control. Out of 12 participants, who had Low serum C peptide level had Normal BMI level. This study suggests measurement of serum c-peptide levels in newly detected diabetic subjects especially of

younger age group is of value. There are some limitations in our study such as small study population, no control group and other parameters like anti GAD antibodies and insulin antibodies were not estimated.

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Supplementary material

Not applicable

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